
Wildlife and Habitat
Management
National Wildlife Refuge System

*Managing Refuges in a
Landscape and Seascape Context*

U.S. Fish & Wildlife Service White Paper
for the
Conservation in Action Summit



Conservation in Action Summit

A new century of conservation challenges

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Executive Summary

The Refuge System must contribute to the needs of the Service's trust resources in all their life stages, wherever they occur. It accomplishes this through active manipulation of populations and habitats, as well as through preservation of intact ecosystems.

Based on the Improvement Act's mandates, as well as the strategic vision provided by *Fulfilling the Promise*, this paper identifies four tenets underlying its proposal for the Refuge System's Wildlife and Habitat Program over the next 15 years:

- The Refuge System will actively manage plant, animal, and fish populations and their habitats on national wildlife refuges as a fundamental responsibility.
- Individual refuges will not be managed in isolation, but in coordination with one another and with other Service programs, and in consideration of the ecosystem needs of the biogeographic regions of the United States.
- Refuge management will be coordinated with the activities and objectives of other public and private land stewards, to the extent such entities choose to engage with us.
- The focus will be on restoring, enhancing, or protecting habitat for selected trust resources in critical need, and on resolving selected issues which most impact them.

The National Wildlife Refuge System Improvement Act of 1997 requires that the Refuge System manage refuges in a system-like, cooperative, and collaborative way.

Following these tenets, the Wildlife and Habitat Team identified six essential elements for the Refuge System, and scored their current condition as optimal, adequate, inadequate, critical, or unknown:

- **Essential Element #1:** Participate in and contribute to the restoration, enhancement, and protection of productive and healthy migratory bird populations and habitats in a landscape context. (**Inadequate**)
- **Essential Element #2:** Participate in and contribute to the recovery of threatened and endangered species throughout their ranges, including implementation of recovery plan recommendations. (**Inadequate**)
- **Essential Element #3:** Participate in and contribute to the restoration, enhancement, and protection of productive and healthy estuarine and marine ecosystems. (**Critical**)
- **Essential Element #4:** Secure adequate quantities of quality water to provide for the life history needs of migratory birds, threatened and endangered species, and inter-jurisdictional fishes on Refuge System lands and waters. (**Inadequate**)
- **Essential Element #5:** Seek and implement the appropriate role for the Refuge System in the eradication, control, or other management of invasive

plants and animals that threaten indigenous habitats and species across broad landscapes. **(Critical)**

- **Essential Element #6:** Define the role of fire on Refuge System lands and restore, as appropriate, its use in emulating ecological processes and functions to enhance ecosystems on local and landscape scales while also protecting human communities. **(Inadequate)**

This paper also describes the ideal outcomes associated with implementing each of these essential elements. It offers some measurable ways to monitor progress and implementation actions over the next 15 years.

Introduction

Active manipulation of animal and plant populations and their habitats is a core function of the Refuge System and critical to embracing the conservation of populations in a geographic context. As the human population and its associated urban sprawl have increased, more species have seen their habitats disappear or become degraded. Their needs for particular vegetative communities frequently require active manipulation of the land base. Such manipulation satisfies an array of needs for species at particular stages of their life cycles or migratory journeys.

The Refuge System makes choices about the management of habitats and populations on individual stations. It chooses which wildlife species to target, the kinds of habitats that will best provide for those species at various life stages, and the types of strategies that will best create or maintain those habitats. In fully functioning mature ecosystems, for example, refuge biologists may elect to retain the dynamic mosaics created by fire, floods, and other natural ecological processes. On the other hand, biologists may decide to retard succession in a hardwood forest to maintain a shrub understory, or to restore a farm field to prairie.

In all such choices, the Refuge System must coordinate internally, as well as with other federal resource management agencies and state and private partners. Together, they provide the proper resources for the most critical species at the times and places where they are most needed and in the most effective way possible. Such is managing in a landscape context.

Purpose and Need

The Refuge System's wildlife and habitat management programs exist to provide for the needs of the Service's trust resources and, secondarily, to provide opportunities for wildlife-dependent recreation, when compatible. The Refuge System's management is implemented in the context of landscapes and seascapes that are dynamic and changing.

North America has a varied mix of aquatic, vegetative, and animal communities across broad geographic areas. Historically, these were shaped by natural forces, such as fire and flood, which provided micro- and macrohabitats to assure food and cover for the natural composite of wild species.

Conditions have changed, especially in the contiguous U.S. The degradation of landscapes and seascapes has decimated some species and driven others to extinction, and reduced or eliminated the impact of many natural forces, as well. Many animals and plants, especially migratory birds and species on the brink of extinction, struggle to find resources they need. It is the Refuge System's responsibility to conserve those resources, perhaps through protection of intact ecosystems, but more likely through innovative management programs applied to local habitats and larger landscapes.

In meeting its challenge, the Refuge System faces exotic and invasive species, growing restrictions on uses of fire and pesticides, increased competition for water, degraded water and air quality, and the need to embrace a range of nontraditional resources such as corals. Success requires that refuges be seen as critical pieces of a puzzle, the full picture of which is only viewed in the context of landscapes and seascapes, ecosystems, and flyways. The efforts of individual refuges will come to fruition only through myriad partnerships that identify their roles in the larger conservation picture.

Improvement Act Direction

The words and spirit of the National Wildlife Refuge System Improvement Act of 1997 strongly endorse basic wildlife and habitat conservation tenets. Specifically, the concepts are cited in Section 2 (2,3), Section 5 (4), Section 4 (2), and Section 5 (a) (4) of the Improvement Act.

Fulfilling the Promise Vision

In 1998, a national gathering of refuge managers and partners led to publication of *Fulfilling the Promise - The National Wildlife Refuge System - Visions for Wildlife, Habitat, People, and Leadership*. The document gives the historic context for Refuge System management and provides a vision for the future based on principles anchored in the Refuge System Improvement Act. Wildlife and Habitat" (WH) was one of three distinct areas of emphasis of *Fulfilling the Promise*.

The document prefaces its list of 20 recommended WH actions with a call to step down system-level goals to individual refuges, and emphasizes coordination with states, tribes, local governments, and private citizens. Of the 20 recommended actions, five directly relate to at least one tenet of this paper.

- WH-1, 2: Calls for developing landscape scale goals and objectives for habitats and populations of trust resources, specifically migratory birds, threatened and endangered species, interjurisdictional fish, and marine mammals. Individual refuges would step down these goals and objectives to fulfill the individual roles that emerge from this bigger picture.
- WH-3: References landscape-scale goals and objectives for biodiversity. Again, refuges would step these down to individual stations.
- WH-5: Calls for a comprehensive assessment of the status of water rights and needs related to water quantity and timing for each region, including, where appropriate, resolutions to outstanding problems.

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- WH-7: Recommends addressing the invasive species issue. It specifically identifies a need for new policies to strengthen and support our actions in this arena.

The concept of restoring fire-adapted ecosystems is not mentioned specifically in either the Improvement Act or *Fulfilling the Promise*. Yet, fire is a keystone ecological process fundamental to the function and integrity of many ecosystems and species across North America. It is also a basic, cost-effective management tool that can be used to enhance and maintain habitats at broad spatial scales. Used both to restore and maintain ecosystems and emulate natural ecological processes, it has no ecological alternative. Fire is the only manageable disturbance regime appropriate to restoring and managing fire-adapted ecosystems.

Because fire is one of the most changed and restricted of all natural processes within North America, its suppression and alteration have become a global threat to biodiversity. There are many far ranging impacts including: the amount and quality of water runoff; ecosystem composition, structure, and function; local economies; and human lives and property. Fire has become the focus of all land management agencies in the U.S. The current political, economic, and conservation focus directed to fire management makes it an appropriate priority for the Refuge System for the next 15 years.

Essential Elements of Managing in a Landscape and Seascape Context

Based on the Improvement Act's mandates, as well as the strategic vision provided by *Fulfilling the Promise*, this paper identifies four tenets underlying its proposal for the Refuge System's Wildlife and Habitat Program over the next 15 years:

- The Refuge System will actively manage plant, animal, and fish populations and their habitats on national wildlife refuges as a fundamental responsibility.
- Individual refuges will not be managed in isolation, but in coordination with one another and with other Service programs, and in consideration of the ecosystem needs of the biogeographic regions of the United States.
- Refuge management will be coordinated with the activities and objectives of other public and private land stewards, to the extent such entities choose to engage with us.
- The focus will be on restoring, enhancing, or protecting habitat for selected trust resources in critical need, and on resolving selected issues which most impact them.

While many of the Service's trust resources could be considered in critical need, the team chose to focus on two -- migratory birds and threatened and endangered species -- and their habitats. The team chose also to address the critical issues of fire, water, and invasives.

Additionally, the team chose to focus on a somewhat nontraditional resource for the

Refuge System, that of marine ecosystems, specifically coral reefs and estuaries. Recent concern and emerging data indicate the health and productivity of oceans around the world are declining. Wildlife refuges along the coasts, islands, and atolls include vast areas of estuarine, coastal marine and open ocean habitats that are essential to a complex web of marine species. Wading and shore birds, seabirds, corals and other benthic invertebrates, fish and shellfish, marine mammals and sea turtles require productive habitats found in refuges. These marine refuges, many of them world class, form a network of lands, near-shore habitats, and marine waters fundamental to the conservation and management of the nation's fish, wildlife and plant resources.

In viewing refuges as part of a larger landscape puzzle, the team steers individual stations, groups of stations, and the Refuge System toward collaborative partnerships that address habitat and wildlife needs on realistic geographic scales.

In viewing refuges as part of a larger landscape puzzle, the team steers individual stations, groups of stations, and the Refuge System toward collaborative partnerships that address habitat and wildlife needs on realistic geographic scales. Such cooperative management dovetails with two key mandates of the Improvement Act: “system-like management” and “cooperation and collaboration.” Further, by focusing on resources as diverse as migratory birds, selected marine resources, threatened and endangered species, and their respective habitats, the team embraces the biodiversity directive of the Act, and capitalizes on the public's economic and emotional investment in these resources.

In summary, the team identified six essential elements for the next 15 years:

- **Essential Element #1:** Participate in and contribute to the restoration, enhancement, and protection of productive and healthy migratory bird populations and habitats in a landscape context.
- **Essential Element #2:** Participate in and contribute to the recovery of threatened and endangered species throughout their ranges, including implementation of recovery plan recommendations.
- **Essential Element #3:** Participate in and contribute to the restoration, enhancement, and protection of productive and healthy estuarine and marine ecosystems.
- **Essential Element #4:** Secure adequate quantities of quality water to provide for the needs of migratory birds, threatened and endangered species, and interjurisdictional fishes on Refuge System lands and waters.
- **Essential Element #5:** Seek and implement the appropriate role for the Refuge System in the eradication, control, or other management of invasive plants and animals that threaten indigenous habitats and species across broad landscapes.
- **Essential Element #6:** Define the role of fire on Refuge System lands and restore, as appropriate, its use in emulating ecological processes and functions to enhance ecosystems on local and landscape scales while also protecting human communities.

**Key Outcomes of
the NWRS Wildlife
and Habitat Program**

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After implementing the essential elements for 15 years, the team envisions the Refuge System will have successfully:

1. Participated in and contributed to the restoration, enhancement, and protection of productive and healthy migratory bird populations and habitats in a landscape context.

In partnerships with states, joint ventures, and others, refuges will be engaged in protecting, restoring, and/or enhancing habitats to maximize their contribution to national migratory bird conservation objectives, as described in national migratory bird conservation plans (e.g. the North American Waterfowl Management Plan, Partners in Flight, the United States Shorebird Conservation Plan, and Waterbird Conservation for the Americas).

In cooperation with partners and other stakeholders, the Refuge System will have developed goals and objectives for key migratory bird species at appropriate local, ecosystem, Bird Conservation Region, flyway, national, and international levels.

Individual refuges, using appropriate planning mechanisms within landscape-scale partnerships, will have identified their contributions to meeting national objectives, and communicated those intentions to partners. Each refuge, having determined which priority bird species will benefit most from their actions, will be providing healthy, productive habitats for 100 percent of those species.

2. Participated in and contributed to the restoration, enhancement, and preservation of productive and healthy estuarine and marine ecosystems.

In partnership with states, U.S. territories and all appropriate partners, all estuarine and marine refuges will be fully engaged in protecting, restoring, and/or enhancing lands and waters to maximize their contributions toward achieving national goals and objectives for estuarine and marine habitats and species, especially coral reefs and interjurisdictional fishes.

Individual refuges, using appropriate planning mechanisms, will have stepped these down to identify their individual roles in meeting these goals and objectives. Having determined which key species of fish, wildlife and plants will represent an intact, healthy and biologically diverse marine ecosystem, refuges will be providing healthy, productive habitats for 100 percent of those species. Partners in upland watersheds affecting these resources will be fully engaged in collaborating with the Refuge System to address land-based sources of pollution degrading water quality and identifying mitigation measures to reduce other external threats. Water quality parameters in estuarine and marine habitats on refuges will meet criteria for the protection of aquatic life, and invasive species will not be present.

3. Participated in and contributed to the recovery of threatened and endangered species throughout their ranges, including implementation of recovery plan recommendations.

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The Refuge System will be involved in planning and implementing threatened and endangered species recovery plans, and monitoring and assessing the status of listed species. A full inventory of threatened and endangered species on refuges will be completed, including a list of those that depend on refuges for a significant part of their life history.

Each refuge identified in recovery plans will be engaged in fulfilling its role. It will have developed objectives around that role, incorporated objectives and strategies into CCPs and step-down plans, and will be actively managing them accordingly.

Refuge managers are fully engaged with the threatened and endangered species program. This would include participation in recovery planning teams, implementation of recovery plans, monitoring the status of listed species, and providing biological expertise and logistical support where appropriate. Refuges would manage candidate species to prevent listing and would be coordinating with local Ecological Services Offices and neighboring land managers to ensure consistent implementation of recovery actions. Strong ties will exist between Refuges and the endangered species programs.

4. Secured adequate quantities of quality water for migratory birds, threatened and endangered species, and interjurisdictional fishes on Refuge System lands.

The Refuge System will have acquired sufficient expertise to quantify, protect, and acquire water resources to fulfill its mission. At this level, all regions and the Washington Office will have water resource expertise to manage and guide quantification, water rights will be measured and protected, and regions will be able to defend claims, acquire adequate water resources, and document beneficial use.

5. Will seek and implement the appropriate role for the Refuge System in the eradication, control, or other management of invasive plants and animals that threaten indigenous habitats across broad landscapes.

Exotic and other invasive species of plants and animals will have no or negligible adverse impacts on refuge management actions, or such impacts will be negligible. Map-based inventories will be complete for existing infestations, and management of these infestations – including habitat restoration where appropriate – will be underway.

Procedures and infrastructure, including mechanisms for prevention, early detection, and rapid response, will preclude significant new infestations. Appropriate partners, especially local neighboring landowners and counties, will be full players in this process and likewise benefit.

As a result, the Refuge System will be spending relatively little for invasive species management. The rate of introduction and spread will have been reversed.

6. Defined the role of fire on Refuge System lands and have restored, as

appropriate, its use in emulating ecological processes and functions to enhance ecosystems on local and landscape scales while also protecting human communities.

Fire will be utilized both as a resource management tool and to mimic ecological processes in the restoration and maintenance of fire-adapted ecosystems. It will be in widespread use on approximately 500,000 or more acres of NWRS fire-adapted ecosystems in the conterminous U.S. annually, and on 90 percent of the NWRS fire-adapted ecosystems in Alaska. Fire management activities will be integral to refuge resource and habitat management goals and objectives. The fire program will use research and monitoring in the adaptive management process.

Sufficient resources and infrastructure will be available to support fire management operations, including meeting staffing, equipment, facility, and monitoring needs. Refuges will be able to meet their prescribed fire objectives with emission levels that meet national and state air quality regulations. Critical partnerships will be in place with rural fire districts, communities, Tribes, nongovernmental organizations, appropriate state resource management agencies, and appropriate state and federal air quality agencies.

As a result, fire-adapted ecosystems within the Refuge System will have been restored to their historical fire regimes and ecological conditions, will be maintained in desired ecological conditions as quantified in Refuge Comprehensive Conservation Plans or Habitat Management Plans. Risks to communities adjacent to Service lands will have been mitigated.

Defining Success

Key factors have been identified to measure progress and success for each essential element as noted in Table 1 on the following page.

Table 1
Essential Elements -- Wildlife and Habitat

Essential Element	Outcome at Optimum Condition	Success Factor
Migratory Birds	In partnership with states, joint ventures, and others, all refuges have identified their individual roles in meeting landscape scale goals and objectives for migratory birds and are fully engaged in protecting, restoring, and/or enhancing habitats to maximize their contribution.	Percentage of refuges managing under station goals and objectives stepped down from landscape scale goals and objectives for migratory birds. The percentage of the Service's migratory bird species of conservation concern whose habitat needs are being met on refuges.
Marine and Estuarine Resources	The management of estuarine and marine habitat within the NWRS is recognized as a key component in improving ocean health and productivity by implementing comprehensive conservation measures to maintain intact estuarine and marine ecosystems, including coral reef ecosystems, and where appropriate restore degraded marine ecosystem components.	Percentage of marine coastal refuges that exceed federal and/or state water quality protection standards for key indicator species of shellfish, fish, and wildlife identified by the refuge; populations of these indicator species deemed to be healthy and intact based on the diversity, abundance and distribution in accordance with historical conditions.
Threatened and Endangered Species	We know what threatened and endangered species depend on refuges for a significant part of their life histories and how to provide for those needs, and are fully implementing programs to do so. The Refuge System is fully engaged at the national level with the Endangered Species Program to provide policies, training, and assessment and management tools that facilitate involvement of field stations in recovery.	Reliable knowledge of threatened and endangered species which depend heavily on refuges and the percentage with monitoring programs and active habitat restoration and/or management in place.
Water Quality and Quantity	The Refuge System has sufficient expertise to quantify, protect and acquire water resources for the fulfillment of its mission. Needed water resources have been identified and acquired and successfully defended. Water quality issues are being addressed with partners, and all appropriate refuges are engaged in mimicking natural water regimes and restoring or enhancing aquatic habitats.	Percentage of refuges that have identified and assessed water resources requirements, uses, and issues; Percentage of refuges that adequately measure and monitor water resources for quantity, quality, purpose, and timing; Percentage of refuges where water resource requirements have been adequately protected with data being regularly reported, when required, to state water management agencies.
Invasive Species	Reversal of the rate of introduction and spread of invasive species to enable the Service and Refuge System to meet their missions and purposes in cost effective ways.	Development of a comprehensive inventory of invasives on Refuge System lands, and the rate of introduction and spread of invasive species from the baseline. This includes tracking both individual species, and overall lands infested. Total expenditure of System funding on invasives issues.
Fire Management	NWRS is fully engaged in the restoration, protection, and maintenance of fire-adapted ecosystems. Safeguards are in place to protect the public and communities at risk in the wildland-urban interface adjacent to refuges. Mechanisms are in place to enhance the safety of firefighters responding to unplanned wildlife fire.	Development of comprehensive inventory of refuge lands to document the appropriate Fire Regime Condition Class and desired ecological condition. Percent of acres maintained or restored to desired condition, and acreage burned under natural ecological conditions (i.e., Fire use). Percent of refuges adequately funded to meet their program objectives. Percentage of risk to communities mitigated.

Assessing Current Conditions -- Where Are We Today?

While the Refuge System has achieved much success, it has much to do in habitat restoration and management.

The Wildlife and Habitat Team scored the current condition of the Refuge System relative to a set of Condition Class Ratings identified as Condition Class 1 (Optimal), Condition Class 2 (Adequate), Condition Class 3 (Inadequate), Condition Class 4 (Critical), and Condition Class 5 (Unknown).

Standardized condition classes provide a consistent method to assess individual field stations' abilities to implement a sound wildlife and habitat program. For each essential element, assessment criteria are provided for five condition classes: Condition Class 1 – Optimal (continue successful efforts), Condition Class 2 – Adequate (meets the requirement), Condition Class 3 – Inadequate (needs action), Condition Class 4 – Critical (needs immediate action), Condition Class 5 – Unknown. Conservation in Action Summit participants and reviewers of this document are encouraged to recommend refinement or modification of the performance criteria so they best reflect the most meaningful measure of success.

The team's scores were as follows:

Essential Wildlife and Habitat Element	Current Condition Class
Landscape-level conservation of migratory birds	Class 3 - Inadequate
Conservation of the System's estuarine and marine resources	Class 4 - Critical
Engagement in recovery of T&E species	Class 3 - Inadequate
Assurance of adequate quality water	Class 3 - Inadequate
Management of invasives species	Class 4 - Critical
Restoration of fire as ecosystem management tool	Class 3 - Inadequate

Rationale for the above ratings follows:

1. Participate in and contribute to the restoration, enhancement, and protection of productive and healthy migratory bird populations and habitats in a landscape context. (Condition Class 3 – Inadequate)

While refuges contribute to migratory bird conservation, how much refuge work is targeted, but remains incomplete, is unknown. Planning within Bird Conservation Regions (BCRs) is a relatively new and evolving process. Although planning is underway in many BCRs, partnerships are in the initial stages, and planning has yet to begin

in many areas of the country. Where planning has begun, refuges may not be fully engaged due to a variety of factors including inadequate communication and insufficient information, tools, or staff. In addition, the Refuge System can further contribute to the national information about migratory birds through monitoring protocols, such as nest productivity monitoring, breeding and stopover passerine surveys, waterfowl banding and census, waterbird nesting site monitoring, and shorebird surveys.

2. Participate in and contribute to the restoration, enhancement, and protection of productive and healthy estuarine and marine ecosystems. (Condition Class 4 – Critical)

Estuaries and marine ecosystems, including coral reefs, are some of the most biologically rich and economically valuable ecosystems in the world. They are also in serious jeopardy, threatened by an increasing array of impacts, such as exploitation, pollution, habitat loss, invasive species, diseases, and climate change. With its network of estuarine and marine habitats, the Refuge System can provide a model for how to protect and restore these resources, both in the U.S. and internationally. However, the System is only now embracing this role, and much work lies ahead. Given the magnitude and immediacy of the threats, the Refuge System must expand its knowledge about protection and restoration of marine and nearshore habitats. This includes an immediate need for research and applied adaptive management to fill these data gaps.

Fifty-six refuges have been established for endangered species, and approximately 185 federally listed species occur on refuge lands.

3. Participate in and contribute to the recovery of threatened and endangered species throughout their ranges, including implementation of recovery plan recommendations. (Condition Class 3 – Inadequate)

Fifty-six refuges have been established specifically for endangered species, and approximately 185 federally listed species occur on refuge lands. Many refuges play a critical role in the recovery of listed species, while others manage for listed species despite a non-endangered species purpose. Still, the Refuge System could do more to synchronize recovery actions over multiple refuges within flyways to optimize benefits to listed species. Also, without more broad-based, active engagement of refuges with partner landowners, the System might become the sole remaining sanctuary for some species that may never be delisted because of permanent habitat loss elsewhere.

Endangered Species Act processes do not yet dovetail well with refuge management processes. Compartmentalization within the Service has precluded a comprehensive, collaborative approach that integrates the Refuges and Endangered Species Programs. This is coupled with lack of critical data and need for more and better cooperative planning. Comprehensive knowledge of listed species on refuges is lacking, as are baseline data of all refuge flora and fauna from which to cross-reference new listings. Additionally, CCPs or related step-down plans are not yet in place on all refuges that support listed species, which prevents full implementation and tracking of recovery actions identified for specific stations.

4. Secure adequate quantities of quality water sufficient to provide for the life history needs of migratory birds, threatened and endangered species, and

interjurisdictional fish on Refuge System lands. (Condition Class 3 – Inadequate)

Escalating conflicts over water use are requiring more complex hydrologic and water use data to protect Service water resources. The Service has limited influence over water quantity, quality, and timing in the Refuge System because the state laws control water allocation and administration. Many western states have general stream adjudications to determine the priority, quantity, diversion point, and place and nature of use of all the water users on the system. Permitting of water use is becoming increasingly common as eastern states modify their water laws. Larger scale interstate stream conflicts (recently illustrated by legal disputes between Maryland and Virginia, and among Georgia, Alabama, and Florida) will have long-lasting impacts on water availability. The technical hydrologic and biological data required to protect Service water resources in these administrative and judicial proceedings have become increasingly complex, and data collection and analysis take years.

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Established data collection systems are limited in the Western regions, and virtually nonexistent in the East. Limited water resources data are being applied to water management decisions, primarily in the Western regions. Additional water needs are being identified at very few refuges. Water resources data are being reported to state water management agencies as required in the Western regions, but not in Eastern regions. Some states are not issuing water use rights. Water quality data are being collected in very few locations nationwide, and little is being done to protect water quality on a landscape level.

5. Seek and implement the appropriate role for the Refuge System in the eradication, control, or other management of invasive plants and animals that threaten indigenous habitats across broad landscapes. (Condition Class 4 - Critical)

Invasive exotics are the greatest threat to ecosystem integrity within the Refuge System. More than 80 percent of refuges report problems with invasive organisms. Most refuges have no detailed inventory or maps of invasive distributions and no means to create either. A survey of invasive species on refuges, recently conducted by USGS, revealed that most managers did not have adequate baseline information. Managers may be unsure of how existing infestations affect habitat, how to treat those infestations, where to report their needs, or where to turn for expert or administrative support.

In addition, most, if not all, refuges have no means to identify potentially devastating incipient invasive populations (such as the appearance of the brown tree snake). Although invasives projects continue to be the fastest growing component of RONS, funding priorities are usually dominated by other System needs. Stronger leadership and additional resources at the regional and national levels, through policy and administration, are necessary to move invasive issues into the forefront of refuge management.

6. Define the role of fire on Refuge System lands and restore, as appropriate, its use in emulating ecological processes and functions to enhance ecosystems

on local and landscape scales while also protecting human communities.
(Condition Class 3 - Inadequate)

Although the use of fire in ecosystem restoration and adaptive management has increased in recent years, current resource levels allow only 50 percent of the desired acreage to be treated annually. The use of Fire Regime Condition Class (FRCC) is an inaccurate gauge for the condition of refuge lands because it is based on historic, not desired, condition and provides marginal capability for assessing true risk to firefighters and communities.

Current fire resource levels are allowing only 50 percent of the desired acreage to be treated annually.

Fire management activities are not being conducted as economically as possible, while the cost of managing the fire program is increasing rapidly. With existing resources, the fire program will be unable to maintain restored lands, restore additional fire adapted ecosystems, protect critical communities, maintain critical program infrastructure, provide for firefighter and public safety, or adequately monitor fire activities.

National Fire Plan directives do not mesh well with the Refuge Improvement Act and other historic legislation and policy concerning refuge lands. Performance measures have become more focused on hazardous fuels and Wildland Urban Interface (WUI) projects prioritized to protect communities, change FRCC, and utilize contracted and mechanical treatment processes. Prescribed burning for ecosystem restoration was a priority when the National Fire Plan was initiated, but has become a lower priority. New directives, including the Healthy Forest Restoration Act and Healthy Forest Initiative, directly relate to burning for ecosystem restoration, but even nominal funding has not been allocated. Fire managers are forced to focus on hazard fuels and WUI, increasing the difficulty of meeting ecosystem restoration and maintenance goals. WUI projects have significantly higher per acre costs, often utilizing mechanical treatments to meet contracting directives, resulting in less acreage treated. New smoke emission regulations may also limit our ability to meet management objectives on NWRS lands, especially in designated wilderness areas.

**Measuring Progress
-- How Do We Know
if We Are Improving?**

Measuring the success of the wildlife and habitat program will be done through the condition assessment framework in Appendix I.

Additionally, the team proposes development of a Habitat Condition Classification Index (HCCI) to score habitat conditions on refuge lands. The HCCI would describe the condition of various habitats as compared to the desired condition, defined in each station's habitat management objectives. Baseline scoring of habitats on each field station might occur in conjunction with the development of a Habitat Management Plan (HMP). Development of the index would occur with input from field stations and appropriate partners, and might consider desired habitat parameters and obstacles to achieving them. Examples might include presence of invasives, lack of suitable water, need for prescribed burning, presence of contaminants, or similar concerns. The team proposes development of the HCCI within one year. It would be applied to refuges incrementally.

**Relationship to
Nationwide
Conservation Efforts**

Not surprisingly, the six essential elements elected by the Team — migratory birds, marine resources, threatened and endangered species, water, invasives, and fire — are critical conservation issues for the nation as a whole. They conjure up a range of causative agents that contribute to environmental problems of national concern: contaminants and other environmental quality factors; habitat loss and degradation due to development; overexploitation; international trade and development that promote movement of species; economic inequities within the Americas that contribute to habitat loss in the southern continent; and expansion of the wildlife-urban interface with its increasing risk of life and property to fire.

These elements are tightly interwoven with many of the most critical cultural, social, economic, and conservation concerns of the United States today. They are relevant to the full range of State, Federal, and private agencies, organizations, and landowners engaged in land management and wildlife conservation. The Refuge System cannot make real progress in any single arena without an aggressive and creative partnership effort among these many entities.

**Where do We Start?
Developing Shared
Priorities**

The Wildlife and Habitat Team suggests some first steps toward moving all six essential elements to Condition Class 1, Optimal. Participants at the conference may refine and prioritize this list to develop a shared sense of how to proceed.

Essential Element #1: Migratory Birds

- Within five years, implement a System-wide migratory bird monitoring program by fully integrating refuges into ongoing monitoring by partner programs, agencies, and organizations. This will be facilitated with standardized protocols applied across the Refuge System, consistent data storage and analysis, and coordinated monitoring at different spatial scales.
- Within five years, fully implement the guidelines outlined in *A Process for Integrating Wildlife Population, Biodiversity, and Habitat Goals and Objectives on the National Wildlife Refuge System: Coordinating with Partners at all Landscape Scales*. This entails full participation in NABCI Bird Conservation Region (BCR) planning to develop refuge species priorities and associated habitat management guidelines and monitoring protocols.
- Within 10 years, establish with partners support centers organized around BCRs to provide research, technical assistance, and decision support tools for land managers. These may be co-located with existing USGS Science Centers, possibly using the HAPET model. This entails full participation in the Service's Biological Landscape Planning Team.

Essential Element #2: Marine and Estuarine Ecosystems

- Immediately initiate an inventory and assessment of estuarine, coral reef, and

other marine habitats on refuges. Within one year, identify and initiate monitoring of associated keystone species. Establish permanent monitoring stations within five years to track trends and assess restoration and recovery potential.

- Within two years, identify key threats to estuarine and marine species and habitats on refuges, and within five years identify and initiate priority actions to address immediate or point-source threats. Within 15 years, identify and implement local strategies to address long-term, chronic, or non-point source threats.
- Within two years, conduct surveys of all refuges identified in the Inventory of Marine Managed Areas to determine marine and estuarine boundaries.
- Over the next five years, create seascape-scale goals and objectives to complement and supplement landscape scale efforts for the Refuge System.

Within six months, formalize a liaison between the Refuges and Endangered Species Programs, perhaps through shared staff.

Essential Element #3: Threatened and Endangered Species

- Within six months, formalize a liaison between the Refuges and Endangered Species Programs, perhaps through shared staff. Use liaison to improve coordination regarding Section 7 consultations, candidate conservation, listing, and recovery issues.
- Within one year, develop an NCTC training course on listed species management on national wildlife refuges.
- Within one year, develop a tracking tool to identify refuges referenced in recovery plans and assess the status of their associated action items. Begin implementing recovery actions not currently underway within one year of their identification.
- Within one year, adopt a standard protocol for Rapid Ecological Assessments (REA) of refuges that would facilitate inexpensive but quick assimilation of the natural resources of each refuge. Implement within two years, and complete baseline flora and fauna lists within 10 years.
- Within 10 years, and using the CCP process where appropriate, have in place goals and objectives reflecting individual station responsibilities for recovery plan actions and/or conservation of candidate species.

Essential Element #4: Invasive Species

- Over the next year, support Early Detection/Rapid Response activities throughout the Refuge System. Utilize volunteers for early detection efforts and direct newly formed Invasive Species Strike Teams to concentrate on incipient infestations.

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- Within one year, develop a threat assessment tool to determine how resources should be allocated to combat the invasives challenge by directing limited resources to the most serious problems.
 - Within two years, integrate existing databases for reporting and monitoring invasive species information within the NWRS so that all data are available within a single source.
 - Within two years, develop administrative infrastructure to address the scope of the invasives threat. Potential structure might include a staffed branch within the Washington Office, dedicated invasives coordinators for refuges in Regional Offices, and dedicated invasives biologist field positions.
 - Within three years, revise appropriate FWS policies to include invasive species elements that reflect growing concern over invasive species on refuges. These include policies related to integrated pest management, equipment/vehicle sanitation, water, fire and land acquisition.
 - Within five years, complete a map-based inventory of invasive species on refuges and adjoining properties.

Essential Element #5: Water Quality and Quantity

- Within two years, implement a campaign to raise NWRS employees' awareness of State and Federal water laws, doctrines, rights and legal processes.
- Quantify refuge water resources through physical measurement systems: 30 percent of NWRS within five years; 60 percent within 10 years; and 100 percent within 15 years;
- Within 10 years, identify refuge water requirements and water threats on all refuges.
- Protect refuge water resources by reporting water use to State water agencies: 30 percent of NWRS within five years; 60 percent within 10 years; and 100 percent within 15 years
- Over 15 years, secure necessary water rights under state water laws as possible.
- Over 15 years, assert federal reserved water rights as required.
- Within 15 years, fully fund water rights costs, including irrigation district assessments and electric utility costs associated with pumping water.

Essential Element #6: Fire Management

Within two years, identify and incorporate wildland fire use on all refuges as applicable to meet management objectives.

- Within two years, identify and incorporate wildland fire use on all refuges as applicable to meet management objectives.
- Within five years, ensure that 100 percent of critical program infrastructure needs, including staffing, equipment, facilities, and monitoring are met.
- Over five years, increase the number of acres of hazardous fuels treated with fire by 20 percent per year to reach desired treatment objectives of 500,000 acres annually.
- Within five years, identify the “Desired Condition” of all NWRS lands based upon management needs contained within CCPs and HMPs, incorporating FRCC where possible.
- Within 10 years, identify and mitigate 100 percent of the wildland fire risk from FWS lands to communities.

Appendix I

Performance Assessment Criteria -- Wildlife and Habitat

Condition Class	Essential Elements					
	Landscape-level conservation of migratory birds	Conservation of the System's estuarine and marine resources	Engagement in recovery of threatened and endangered species	Assurance of adequate quality water	Management of invasive species	Restoration of fire as an ecosystem management tool
Condition Class 1 Optimal	Individual refuges, having determined which migratory bird species of conservation concern will benefit most from their actions, are providing healthy, productive, habitats for 100% of those species. Also, 100 percent of stations are managing under station goals and objectives stepped down from a landscape-scale framework	Indicator species of fish, wildlife and plants that represent multiple trophic levels in these ecosystems are present at historic levels of abundance, distribution and relative health and recover quickly from natural and/or anthropogenic stress. Water quality parameters are at historic baseline levels. Invasive species are not present.	Full inventory is in place of T&E species on refuges, including a list of those which depend on refuges for a significant part of their life history. One hundred percent of CCP's for T&E refuges are in place and include clear statements of the individual refuge contribution to T&E species; implementation is ongoing.	All regions and the Washington office have water resource expertise available to guide quantification of refuge water requirements. Refuge water needs are assessed, and rights are measured and protected. Regions have high success rates in defending claims and acquiring water rights, and have well documented records of beneficial use.	Early detection and rapid response mechanisms are in place to preclude establishment of new infestations. Map-based inventories are completed and tracking is occurring on 100 percent of refuges. Also 100 percent of appropriate refuges have incorporated invasives management into goals and objectives.	One hundred percent of refuge lands are inventoried and classified as to Fire Regime Condition Class and desired ecological condition; and 100 percent of refuge fire-adapted habitats are in the desired Fire Regime Condition Class or desired ecological condition as called for in associated refuge habitat management objectives.
Condition Class 2 Adequate	Individual refuges, having determined which migratory bird species of conservation concern will benefit most from their actions, are providing healthy, productive, habitats for 75-99 percent of those species. Also, 75-99 percent of stations are managing under station goals and objectives stepped down from a landscape-scale framework	Abundance, distribution and relative health of indicator species of fish, wildlife and plants that represent multiple trophic levels in these ecosystems are stable or increasing and recover from natural stress and/or anthropogenic stress. Water quality parameters are improving. Invasive species infestations are decreasing.	Full inventory is in place of T&E species on refuges, including a list of those which depend on refuges for significant part of their life history. Also, 75-99 percent of CCPs for T&E refuges are in place, and include clear statements of the individual refuge contribution to T&E species, with implementation ongoing.	All regions have water resource expertise available to quantify refuge water resources. Some refuge water needs are assessed and rights protected, and beneficial use is measured and documented. Regions are collecting baseline information and are engaged in protecting water use on additional refuges.	Early detection and rapid response mechanisms are in place to catch new infestations within a reasonable time. Map-based inventories are completed and tracking is occurring on 75-99 percent of refuges. Also, 75-99 percent of appropriate refuges have incorporated invasives management into goals and objectives.	Seventy-five to a ninety-nine percent of refuge lands are inventoried and classified as to Fire Regime Condition Class and desired ecological condition; and 75-99 percent of refuge fire-adapted habitats are in the desired Fire Regime Condition Class or desired ecological condition as called for in associated refuge habitat management objectives.

Condition Class	Essential Elements					
	Landscape-level conservation of migratory birds	Conservation of the System's estuarine and marine resources	Engagement in recovery of threatened and endangered species	Assurance of adequate quality water	Management of invasive species	Restoration of fire as an ecosystem management tool
Condition Class 3 Inadequate	Individual refuges, having determined which migratory bird species of conservation concern will benefit most from their actions, are providing healthy, productive, habitats for 50-74 percent of those species. Also, 50-74 percent of stations are managing under station goals and objectives stepped down from a landscape-scale framework.	Abundance, distribution and relative health of indicator species of fish, wildlife and plants that represent multiple trophic levels in these ecosystems are declining. No measurable recovery from natural stress and/or anthropogenic stress. Water quality parameters are stable or declining. Invasive species infestations are increasing.	Inventory of T&E species on refuges, including those which depend on refuges for significant part of their life history, is NOT in place. Also, 50-74 percent of CCPs for T&E species refuges are in place and include clear statements of the individual refuge contribution to T&E species; with implementation ongoing.	Not all regions have water resource expertise. Western regions are not documenting beneficial water use sufficiently. Refuge System goals and objectives are compromised because requirements are not adequately protected.	No rapid response and early detection mechanisms are in place. Map-based inventories are completed and tracking is occurring on 50-74 percent of refuges. Also, 50-74 percent of appropriate refuges have incorporated invasives management into goals and objectives.	Fifty to seventy-four percent of refuge lands are inventoried and classified as to Fire Regime Condition Class and desired ecological condition; and 50-74 percent of refuge fire-adapted habitats are in the desired Fire Regime Condition Class or desired ecological condition as called for in associated refuge habitat management objectives.
Condition Class 4 Critical	Individual refuges, having determined which migratory bird species of conservation concern will benefit most from their actions, are providing healthy, productive, habitats for 25-49 percent of those species. Also, 25-49 percent of stations are managing under station goals and objectives stepped down from a landscape-scale framework.	Abundance, distribution and relative health of indicator species of fish, wildlife and plants that represent multiple trophic levels in these ecosystems are declining with threatened or endangered species present and some extinctions. Water quality parameters are declining. Invasive species infestations are displacing native species.	Inventory of T&E species on refuges, including those which depend on refuges for significant part of their life history, is NOT in place. Fewer than 50 percent of CCPs for T&E species refuges are in place and include clear statements of the individual refuge contribution to T&E species; with implementation ongoing.	Water resource expertise is declining through reductions in personnel and funding. Fewer refuges are quantifying water requirements, establishing the rights to use water, and documenting beneficial use. Water quantity and quality has declined severely impacting Refuge System goals and objectives.	No rapid response and early detection mechanisms in place. Map-based inventories are completed and tracking is occurring on fewer than 50 percent of refuges. Also, fewer than 50 percent of appropriate refuges have incorporated invasives management into goals and objectives.	Less than 50% of refuge lands are inventoried and classified as to Fire Regime Condition Class and desired ecological condition; and fewer than 50 percent of refuge fire-adapted habitats are in the desired Fire Regime Condition Class or desired ecological condition as called for in associated refuge habitat management objectives.

Condition Class	Essential Elements					
	Landscape-level conservation of migratory birds	Conservation of the System's estuarine and marine resources	Engagement in recovery of threatened and endangered species	Assurance of adequate quality water	Management of invasive species	Restoration of fire as an ecosystem management tool
Condition Class 5 Unknown	Insufficient data exist to determine criterion.	Insufficient data exist to determine criterion.	Insufficient data exist to determine criterion.	Insufficient data exist to determine criterion.	Insufficient data exist to determine criterion.	Insufficient data exist to determine criterion.